

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Suction Grip Devices

I, GIUSEPPE CALLIGARO, an Italian citizen, of 53, Via Alessandria, Leumann, Turin, Italy, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to suction-grip devices of the type in which a membrane made of flexible resilient material is supported along its outer periphery by a rigid cup-shaped member, and wherein a stem secured centrally to the membrane passes through a central aperture in the cup-shaped member and is connected with means for effecting displacement of the membrane as required for attachment of the device to a water-proof smooth surface.

Devices of this type are known in which the end of the stem remote from the membrane is rotatably connected with a cam adapted to co-operate with the outer surface of the cup-shaped member and fixedly secured to a lever. The lever may be of hook shape, its displacement resulting in axial movement of the stem to produce the desired movement of the resilient membrane.

Devices are also known of the above mentioned type in which the stem movements are effected by rotating an external nut engaging a screw-threaded portion of the stem.

In further known devices the stem extends through a central bore in the cup-shaped member, and a spring is interposed between the outer end of the stem and the outer wall of the cup-shaped member to urge the stem outwardly so as to draw the middle of the membrane towards the cup-shaped member. In order to apply such a suction-grip device to a supporting surface a pressure must first be exerted on the stem to overcome the spring tension in order to flatten the membrane against the surface, so that subsequent outward movement of the stem under the action of the

spring causes the necessary deformation of the membrane to set up a vacuum between the membrane and the supporting surface.

The present invention provides a suction-grip device comprising a flexible resilient membrane supported along its outer periphery by a rigid cup-shaped member having a central aperture through which a stem secured centrally to the membrane passes, an external tubular extension provided on the cup-shaped member and provided externally with a radial flange, a push-button slidable axially within said tubular extension and attached to said stem for effecting movement of the membrane away from the cup-shaped member, and a spring housed in the tubular extension and interposed between an outer surface of the cup-shaped member and the push-button to urge the latter outwardly and draw the membrane towards the cup-shaped member.

An advantage of the device according to the invention is that substantially no further pressure beyond what is necessary to establish a seal between the diaphragm and the surface is required to secure the device to the surface.

The suction-grip device may include means for providing a timely warning of weakening of the grip of the device to a supporting surface. By such means it is possible to avoid sudden loosening of such a device from the supporting surface. Thus the push-button preferably projects from the outer end of the tubular extension and provides in use of the device an indication of the degree of vacuum between the membrane and a surface to which the device is attached.

The invention will be more clearly understood from the following description, given by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 is a front elevational view of a suction-grip device according to one embodiment of the invention;

Figure 2 is an axial sectional view showing

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the device of Figure 1 in its inoperative position before its attachment to a supporting surface;

5 Figure 3 is an axial sectional view similar to Figure 2 illustrating the first step in the attachment of the device to a supporting surface; ---

10 Figure 4 is an axial sectional view similar to Figure 3 showing the suction-grip device adhering to a supporting surface, and

Figures 5 and 6 are a front and a side elevational view, respectively, of a suction-grip device according to a modification of the embodiment of Figures 1 to 4.

15 Corresponding component parts are denoted by the same reference numerals throughout the figures.

20 The suction-grip devices shown in the drawings each comprise a flexible membrane 1 of circular shape made of resilient material, the outer circumferential periphery of which is supported by a circular edge 2 of a rigid cup-shaped member 3. One end portion of an axially extending stem 4 is anchored to the centre portion of the membrane 1, the stem 4 passing through a central aperture in the cup-shaped member 3. The other end portion of the stem 25 4 is connected, by a bayonet joint, indicated diagrammatically at 4a, to an operating push-button 5. The push-button 5 is axially slidable within a tubular extension 6 provided externally on the cup-shaped member 3 coaxially with the stem 4. The member 3 and extension 6 are moulded integrally in plastics material.

35 A helical spring 7 is interposed between the outwardly-facing surface of the cup-shaped member 3 and an inwardly-facing surface of the push-button 5 and is located in an annular space 8 between the tubular extension 6 and the stem 4 to urge the push-button 5 axially outwardly. The end portion of the tubular extension 6 is provided with an integral radially extending flange 9 provided with a plurality of (in this case, three) identical equi-angularly spaced-apart pairs of hooks 10 (Figure 1), the 45 hooks 10 of each pair extending circumferentially in opposite directions and being disposed symmetrically on opposite sides of a radial plane passing through the axis of the device. The arrangement of the hooks 10 is such that 50 at least two hooks 10 can always be utilized for hanging thereon various articles, independently of the angular position of the flange 9 about its axis, when the device is attached to a supporting vertical surface.

55 Figures 2 to 4 illustrate the method of causing the suction-grip device to adhere to a smooth, waterproof supporting surface 11. The device is first presented to the surface 11 with the outer periphery of the membrane 1 in contact with the surface, as shown in Figure 2. The push-button 5 is then moved in the direction of the arrow 12 (Figure 3) to flatten the membrane 1 against the surface 11 and compress the spring 7. During this action the cup-

shaped member 3 is held with the fingers interposed between the flange 9 and the surface 11, so that the force required for compressing the spring 7 is transmitted mainly to the fingers and not to the surface 11.

70 At this stage the push-button 5 is released so that the spring 7, which was compressed by the action of pushing-in the button 5, moves the push-button 5 and the stem 4 outwardly, in the direction of the arrow 15 (Figure 4). This causes flexing of the membrane 1, and draws the centre of the membrane 1 into the cup-shaped member 3 to a position intermediate the surface 11 and the initial inoperative position shown in Figure 2.

80 The drawing of the membrane 1 from the supporting surface 11 creates a vacuum therebetween in a clearance 13, so that the atmospheric pressure acting on the device presses the latter towards the surface 11, holding the device against the surface 11. The device is then capable of supporting considerable loads in addition to its own weight.

85 In order to provide an indication of loss of vacuum in the clearance 13, leading to deterioration in the adherence of the device to the surface 11, the external circumferential surface of the push-button 5 is provided with an inner portion 14 of a colour contrasting with the remaining outer portion of the push-button 5. Under normal operative conditions, (Figure 4) when the device is gripping normally, the portion 14 is disposed wholly within the space 8 and concealed by the tubular extension 6. When, however, the vacuum in the clearance 13, is partly released, the spring 7 moves the push-button 5 in the direction of the arrow 15, exposing part of the inner portion 14 of the push-button 5. The contrasting colour of the portion 14 provides a readily discernable warning. The extent of exposure of the portion 14 provides an indication of the loss of vacuum in the clearance 13. The user of the device is therefore given warning of the necessity of re-establishing a vacuum in the clearance 13. This is effected simply by pressing the push-button 5 while gripping the flange 9 with the fingers until the membrane 1 is again flattened against the surface 11, and then releasing the button 5 to cause the spring 7 115 to return the membrane 1 to the operative position shown in Figure 4.

120 The modification in Figures 5 and 6 differs from the embodiment in Figures 1 to 4 in having a continuous annular flange 9 without hooks 10. Also, the flange 9 is provided on a sleeve 9a which is separately attached by shrink-fitting to the tubular extension 6 of the cup-shaped member 3 so as to be firmly secured to the extension 6.

125 This modification is particularly suitable for supporting a plate (not shown) formed with a keyhole-shaped hole having a circular portion equal r somewhat larger in diameter than the flange 9 and a radially extending portion 130

the width of which does not exceed the outer diameter of the sleeve 9a. One or more such plates can be incorporated in various articles, such as, for example, a box, roll holder and towel holder, so that one or more suction-grip devices, concealed behind the article, can be used to secure the article to a supporting surface.

WHAT I CLAIM IS:—

- 10 1. A suction grip device comprising a flexible resilient membrane supported along its outer periphery by a rigid cup-shaped member having a central aperture through which a stem secured centrally to the membrane passes, an external tubular extension provided on the cup-shaped member and provided externally with a radial flange, a push-button slidable axially within said tubular extension and attached to said stem for effecting movement of the membrane away from the cup-shaped member, and a spring housed in the tubular extension and interposed between an outer surface of the cup-shaped member and the push-button to urge the latter outwardly and draw the membrane towards the cup-shaped member.
2. A device as claimed in Claim 1, in which said flange is formed integrally with the tubular extension.
- 30 3. A device as claimed in Claim 1, in which said flange is formed on a sleeve which is separately attached to the tubular extension.
4. A device as claimed in any of Claims 1 to 3, in which the said flange is annular.
- 35 5. A device as claimed in any of Claims 1 to 3, in which the said flange is formed with a plurality of equi-angularly spaced-apart pairs of hooks.

6. A device as claimed in Claim 5, in which the two hooks of each pair of hooks extend circumferentially in opposite directions and are disposed symmetrically on opposite sides of a radial plane.

7. A device as claimed in any of the preceding claims, in which the push-button is connected to the end portion of the stem remote from the membrane by means of a bayonet joint.

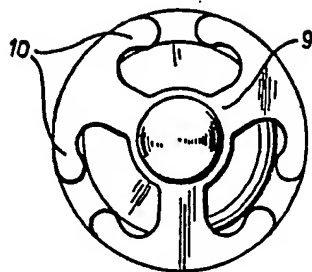
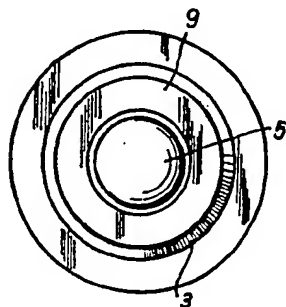
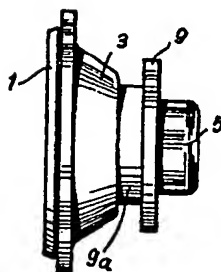
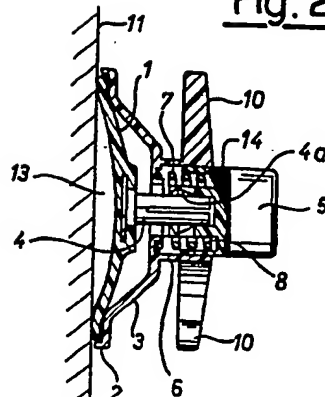
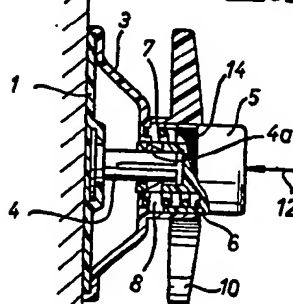
8. A device as claimed in any of the preceding claims, wherein the push-button projects from the outer end of the tubular extension and provides in use of the device an indication of the degree of vacuum between the membrane and a surface to which the device is attached.

9. A device as claimed in Claim 8, in which the external circumferential surface of the push-button is formed with two regions of contrasting colour one of which regions is disposed within and concealed by the tubular extension when a given degree of vacuum prevails between the membrane and a surface to which the device is attached.

10. A device as claimed in any of the preceding claims, in which the cup-shaped member and tubular extension are moulded integrally in plastics material.

11. A suction-grip device substantially as herein described with reference to the accompanying drawings.

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Fig. 1Fig. 5Fig. 6Fig. 2Fig. 3Fig. 4